2017

Water Tower Briefing Report

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Introduction

The purpose of this report is to inform Service Delivery on the Water Tower (WT) performance since it was commissioned into to service from the 8th February 2017 for evaluation and to consider the introduction of this capability into the fleet of operational response appliances.

The WT is designated at Blackburn fire station (E71) and operates as second pump. During the evaluation period the WT has responded to 460 incidents (23pw) under blue light response, which demonstrates it can operate as a standard B-type Appliance, albeit it is classed as a Special Appliance.

In terms of response times, there have been no reports of detrimental impact to emergency service response to incidents. When both E71 appliances respond together, the WT arrives between 40 to 60 seconds behind pump one.

This report will cover eleven fires, which evidence the benefits of having the capability of a Special WT Appliance in the fleet to complement existing Aerial Ladder Platforms (ALP) currently used to provide water tower capability.

Background

In 2012 the Head of Fleet and Engineering Services (FES) was tasked to research alternative water tower appliances. This work led to two options, 1. Dedicated B-type fitted with water tower equipment. 2. Demountable water tower pod body. Whilst the demountable pod body still remains an option, that particular supplier is in the process of building a dedicated water tower to compete with the product being evaluated. The dedicated option being evaluated is shown in **Appendix 1** as a concept vehicle.

Prior to purchasing two Rosenbaur ALP's extensive research had been undertaken to identify the most appropriate aerial vehicle for LFRS. During this time Fleet and Engineering service (FES) worked in collaboration with Greater Manchester Fire and Rescue Service (GMFRS) and produced a framework for Special Appliances (ALP, TTL and Water tower vehicles) for all fire services in the Northwest region. This framework will be extended to maintain the route to market to replace the two older ALP's currently deployed at Preston and Morecambe fire stations.

The reports produced by Head of FES on aerial appliance research and frame work options, mention above, both recommended the development of an aerial strategy and to consider the introduction of a water tower appliance.

At this stage the water tower appliance was simply a concept vehicle Appendix 1. However, the supplier had plans to build a demonstrator vehicle. The Head of FES proposed a twelve month hire agreement to the supplier for the purpose of evaluating the product to determine

its suitability as a concept to enhance LFRS aerial fleet. LFRS Executive Board approved a report to introduce the hire agreement. The vehicle was jointly developed between the supplier and LFRS. The vehicle went into service in February 2017, which leads to this briefing report.

Evidence from Operational Incidents

House Fire - Blackburn

This was the first incident the water tower was used. On arrival of the first pump a radio message was sent to the second pump to say, flames are coming through the roof, be ready to set up water tower immediately on arrival. BA crews from the first pump carried out a search procedure, but found no casualties as the house was unoccupied. On seeing the intense fire in the roof space, BA crews exited the building. As they came out the front door the water tower had set up and was applying water, (Fig 1) which immediately extinguished the fire. The crews stated that, from arrival the water tower took six minutes to set up and extinguish the fire. Due to a quick response, not only was the neighbouring house saved, the structure of the house on fire was also saved. The house only required new roof structure.

Fig 1

Recycling Plant - Chorley

At this incident the photos (Fig 2 & 3) show that the water tower could gain access into the building and set directly alongside the smouldering waste material. There was sufficient height to raise and position the boom over the pile of waste. The hydraulic spike was deployed into the waste and delivered 1000 litres of water, the pile was flooded and fire extinguished. Clearly an alternative method of dealing with such incidents. This avoided the need for firefighters having to manually separate material negating physical effort, increasing firefighter safety, reducing attendance time and increasing appliance availability.

Fig 2

Fig 3

Altham Car Recyclers - Hyndburn

Although the fire was in one area of the compound, it had spread across spread three rows of cars bridging fire breaks to create separate fires. Access to the sight was poor due to rough ground conditions created by plant machinery. Nevertheless, the water tower successfully gained access to a location safe and set to work. Initial supply of water was poor. However, this was addressed and the water tower delivered a jet sufficient to extinguish all three fires in turn. This demonstrated the capability of jet projection. Key benefits from this incident are, the water tower can travel over rough ground to access restricted/tight areas, can deliver a long jet throw, achieving a strong firefighting jet from a distance, which increases fire fighter safety. Again this incident was dealt with quickly avoiding the spread of fire into other surrounding car recycling businesses. The pictures below (Fig 4 & 5) show the appliance location in relation to the three fires with the motorway, which was not closed, in the background.

Fig 4

Fig 5

Large Building Fire - Manchester

This is one of two incidents the water tower attended out of county. This large commercial building fire demonstrates the advantages of the water tower capability. Again the WT has

better accessibility over an ALP. Given the close position achieved to the fire (Fig 6 & 7), the WT jet can reach the whole area to maximum water application resulting in a quick knock down. The benefit of operating from a distance keeps firefighters in a safe zone away from dangerous structures.

Fig 6

Fig 7

Whinny Hill Land Fill Site - Hyndburn

The WT was called to this incident to act as a base pump to feed two other appliances. The photo (Fig 8) shows the WT positioned at the water's edge at the lower level of the quarry floor. The 5,500 L pump delivers water through four 70mm hoses to two appliances positioned at a higher level, which then feed two firefighting jets to the fire. The benefit identified is the WT has the capacity to operate as a High Volume Pump (HVP) and is quicker to deploy than the current HVP which uses much larger hose. Using the WT as an HVP with 70mm hose would reduce road closures. Operational crews also stated that the WT had the capacity to directly feed the firefighting jets, therefore removing the need for the two appliances seen on the photo (Fig 9).

Fig 8

Fig 9

Vehicle Workshop - Ormskirk

The vehicle Workshop contained cylinders so the WT was used to pierce the roof in three locations at different elevations to cool the temperature inside and the cylinders, doing the work of three separate jets. When using the spike, a 1,000 litres of water is delivered in an atomised condition, thus creating a sprinkler system effect. Sufficient water is delivered to cool and extinguish the fire. By maintaining offensive firefighting throughout the incident, the fire was prevented from spreading into surrounding buildings seen on the photos below (fig 10 & 11). Applying water via the WT to onto the cylinders to cool increased the safety of Firefighters during this incident.

Fig 10

Fig 11

Recycling Plant - Blackburn

The WT could not access the side of the building on fire due to the railway banking running alongside and a large pile of waste material blocking the access road to the buildings front elevation. The water supply to this area was also poor. However, the building was pierced and temperature reduced from 380°C to 180°C. This was measured using a thermal imaging camera. The reduction in temperature allowed firefighters to gain closer access to extinguish the fire. The WT was later used as a base pump to feed multiple lines in to the fire front.

Fig 12

Fig 13

Vehicle Workshop – Ingleton North Yorkshire

This was the second incident the WT attended out of County. LFRS ALP and pump from Morecambe was called to assist. The ALP could only apply water onto the building roof to cool and through one hole created by a cylinder exploding. North Yorkshire FRS decided to fall back to defensive firefighting. LFRS Station Manager attained approval to deploy the WT which took one hour to arrive. On arrival the WT quickly set up and pierced the roof of the first unit, applied 1,000L of water through the spike and extinguished the fire. This tactic was repeated three times on units two and three, effectively extinguishing all three fires.

The two blue roofed end units adjacent to the fire on photo (Fig 14), which stored large quantities of engine oil, had been saved, along with the surrounding buildings. During the incident, a large number of coaches had to be moved to the far side of the compound to prevent the fire spreading through the vehicles. It is estimated that £7m of vehicle assets had been saved in addition to the coach company's workshop and surrounding garages. Within an hour of arriving at the scene, the water tower had effectively extinguished all three fires, re-stowed equipment and was on route back to station available for the next incident.

Fig 14

Ridings Mill, Recycling Plant – Oswaldtwistle

The mill stored bails of domestic and clinical waste. The WT gained access through the building to be face onto the bales. On the initial attack (Fig 15), firefighters stood 20' behind the appliance working in a safe zone avoiding rebounding debris and operated the monitor via the remote to direct a jet of water into the core of the fire. The powerful jet broke up the bails and spread the material negating the need to carry out this task manually, avoiding physical effort and fatigue. The second attack (Fig 16) shows the monitor deployed over the bales to apply water to flood the area, extinguishing the fire completely. This technique avoided the need to cut through the rear building panel to attack the fire from behind. Again the incident was completed within one hour of arrival using minimal resource. The Group Manager in charge stated that this had the potential to develop into a 10 pump incident as a barn fire did on the same day. There are clear benefits of having the water tower capability on initial arrival, which ultimately lead to reduced attendance time and enhance firefighter performance and safety.

Fig 15

Fig 16

Vehicle Workshop, Longsight Road – Blackburn

The picture below (Fig 17) shows the most recent vehicle workshop fire in Blackburn. The WT was set up behind the compound wall around the building to protect the crew and vehicle. At this time cylinders inside the workshop where exploding. The fire was quickly supressed and remaining cylinders cooled and finally extinguished. The picture below (Fig 18) shows one of the unexploded cylinders standing in the centre.

Asbestos was suspected to be present in the roof of this building, which would normally require attendance of the decontamination unit. However, the WT was again put to alternative use to decontaminate the site by flushing down the area. Overall benefits learnt from this incident are, firefighter safety maintained whilst cylinder exploded, no requirement for decontamination unit and complex incident dealt with effectively and with minimal resource,

Fig 17

Fig 18

Plastic Recycling Yard – Blackburn

On initial response the WT set up and delivered the full 1500litre tank of water to supress the fire to prevent significant spread. This bought sufficient time for the crew to locate a dedicated water supply from hydrants and the nearby canal. The wall of the compound was used to protect the crew and vehicle whilst firefighting as seen in the pictures below (Fig 19 & 20). The picture (Fig 21) shows a significant amount of unburnt waste material, which would have easily transferred the fire to the houses situated to the left.

Crews reported that the WT performed extremely well at this incident with regard to being able to set up close to the fire whilst working in a safe area behind the compound wall, achieving a strong firefighting jet to initially supress the fire and to reach wider areas around the compound to dampen down waste material preventing fire spread. Once again a quick knock down was achieved leading to reduced attendance time, minimal use of resource and impact on surrounding buildings.

Fig 19

Fig 20

Fig 21

Firefighter Safety and Environmental Impact

This is one key area where the appliance has really proved its worth. In all the recycling plant and vehicle workshop incidents, particularly where cylinders are present, there has been consistent reference to fire fighters working at a safe distance away from the dangers present at front line firefighting areas. Examples of this are; radiated heat, exploding cylinders, (This occurred at three workshops fires) unstable surfaces, falling and flying debris produced from jet reaction and roof voids where it would be dangerous to commit personnel. On the last two incidents reported above, the WT was position behind the boundary wall to protect crews and by using the camera system, water was delivered at a height approx. 11m to quickly extinguish the fire safely.

In many of the above incidents, whilst firefighters work in the areas deemed as safe zones, offensive firefighting has been maintained as opposed to falling back to defensive tactics. This resulted in quick fire knock downs, preventing fire spread to neighbouring buildings, which in turn saves local businesses and sustained employment within the local area.

Although LFRS incur additional operating costs, there are direct benefits to the environment and local economy worthy of recognition.

National Asset

The Environment Agency have stated to Station Manager Neil Hardiman that they have been very impressed by the appliance, so much in fact that they would like to see it recognised as a national/regional asset. SM Hardiman has received a report from the EA which includes the water tower in their tactical plan for dealing with an illegal waste site.

ALP & Water Tower Trials

In August 2017 Fleet and Engineering undertook water trials on the Water Tower and Rosenbaur Aerial Ladder Platform to determine the capability of each vehicle in light of the Grenfell fire in London. **Appendix 2** shows the comparison of water jet projection in four different test conditions.

The outcome of, Test 1, proved that the jet produced from the Water Tower achieved a height of 50m, which is 5m above the ALP performance at 45m. Equipment on both vehicles was at full vertical extension (WT 16.5m, ALP 32m). The ALP was fed in the normal manner (by one appliance) from open water and the WT drew water from the same open supply.

The ALP was then tested using the WT as the feed pump, Test 2, and the heights achieved are 53m (2000lpm) using two lines in, and 54m (2600lpm) Test 3, using four lines in. This test proves that, the ALP performance can be improved when using the WT larger 5,500lpm pump over the LFRS B-types appliance 2000lpm pumps.

The final test worthy of note is, Test 4. This shows the WT feeding the ALP whilst delivering water through its own boom package. Both boom packages are in the vertical position as in previous tests and a strong firefighting jet can be achieved by both vehicles at a height of 40m. With LFRS current WT capability, four vehicles would be required, i.e. two ALP's and two appliances with 2000lpm pumps. Using the ALP and WT combination not only improves performance, it is a more cost effective arrangement in the fact that only two vehicles are required.

It must be noted that these tests were carried out from optimum water supply.

Evaluation Objectives and Success Criteria

The Project Terms of Reference outline the evaluation and success criteria, which are based on the following;

- The water tower and monitor provide additional aerial firefighting capability
- Piercing tool adds value and additional capability

- The appliance can operate as a B-type
- Stowage and crew cab design meet LFRS requirements
- The larger 5,500lpm pump performs well and provide additional benefits
- There is no detrimental impact of “Response Times”

The evidence provided in this report demonstrates that the majority of these objectives have been achieved. However, from feedback received from operational staff, there are areas of improvement required, particularly with the crew cab. Therefore the following, improvements are currently being discussed with Rosenbaur;

- Increase useable space within crew cab
- Feasibility to increase ride height or ground clearance
- Modify jacking system and boom movements to enhance functionality
- Feasibility to fit a larger ladder
- Modify Camera on boom to improve view (distance to structure) for piercing
- Introduce forward jet into spike
- Improve lead time for vehicle and boom package parts.

Further discussions will take place with Rosenbaur on the above matters and other minor items identified in the evaluation in order to introduce improvements to the vehicle and its equipment.

Financial considerations

The purchase price of the water tower vehicle is commercially sensitive information. It must be noted that the specification of the vehicle actually evaluated is slightly different. However, should LFRS buy this vehicle consideration will be given to age and the hire rate paid for the 12 month evaluation period. The above price will increase subject to contract adjustments or future inflation rates.

Maintenance costs incurred to date for the vehicle and the water tower equipment will need to be analysed in more detail to determine a more realistic budget for ongoing planned and projected maintenance throughout the life of the vehicle. Based on the current maintenance history and mileage an annual budget of £5,500 for the vehicle and £2000 for the water tower equipment, total of £7,500pa is estimated for fair wear and tear. Costs associated to non-fair wear and tear or damage are excluded. In comparison to LFRS current budget for a B-type appliance at £5,500pa and ALP at £17,200pa this budget is deemed reasonable at this point in time.

Fuel costs have also been projected based on actual costs incurred to date. The WT delivers an average of 4.74 m.p.g. LFRS standard B-type appliance delivers an average of 5.46m.p.g. Annual mileage for appliance at a busy station is 8,000. Based on today’s pump price of £5.31 per gallon the WT will cost £1,184 pa more on fuel.

All costs referred to in this report are estimated or predicted based on current costs at the time of writing and are therefore subject to change.

Training

LFRS now have in-place a very robust training plan supported by detailed training documentation. Instructors at Blackburn fire station have reached a high skills level and are very competent in delivering training to crews. All staff have since developed and built upon their experience and knowledge. It is a credit to all staff involved in the operational incidents referred to in this report, the continued effort to maintain their skills, applying flexibility and understanding of this new concept, being prepared to take calculated risks to develop performance and for making this product work successfully.

Conclusion

The evidence in this report clearly demonstrates that the WT can operate as a standard B-type appliance and can achieve acceptable response times. There has been no detrimental impact to Service Delivery performance measures.

The WT has more capability over a standard appliance and or ALP in terms accessibility, functionality, pump performance and alternative application to specific incidents.

The larger pump capacity and performance has proved to be extremely effective in comparison to existing appliance pumps. A review of future appliance specification should be considered.

The WT has demonstrated the importance of having water tower capability on first arrival at incidents that require high level water application.

Firefighter safety is significantly improved on the application of this equipment at certain incidents such as waste sites, vehicle workshops and fire with cylinders present.

Recommendation

The concept has proved to be a successful alternative option to water tower capability, which supports the existing aerial fleet operated by LFRS, it is therefore recommended to consider the introduction of this concept and operate the vehicle as a standard B-type Appliance.

To modify the appliance to carry a larger ladder set which facilitates better access to upper floors on domestic properties.

The benefits achieved from operating a 5,500litre pump indicate a further strategy to introduce more high capacity pumps needs to be considered. Strategically placing standard B-type appliance fitted with 5,500L pumps around the county would potentially reduce the need for pump relays achieving a more cost effect use of resource.

The strategy should also consider pairing appliances with larger pump capacity to ALP’s to improve water tower performance as demonstrated in appendix 2, test 2.

Appendix 1

Rosenbaur Concept vehicle – 2014

Appendix 2

ALP/Stinger Water Trials 07/08/17

Note: All tests from open water.

Test 1

Metz ALP @ 32m fed from 1 x PL by 2 x hoses at 12 bar: Flow 1500 ltr
Height 45m

Stinger at full extension and full power Height 50m

Appendix 2

Test 2

Metz ALP @ 32m fed from Stinger by 2 x hoses at 12 bar: Flow 2000 ltr
Height 53m

Appendix 2

Test 3

Metz ALP @ 32m fed from Stinger by 4 x hoses at 12 bar: Flow 2600 ltr
Height 54m

Appendix 2

Test 4

As Test 3 and also Stinger Nozzle being fed at full power

ALP Flow 1800 ltr
Height 40m

Test 5

Metz ALP @ 15m fed from 1 x PL by 2 x hoses at 10 bar (max achieved) Flow 2000 ltr

Test 6

Stinger fed from Tank only – time to empty:

½ power 42 sec
Full power 23 sec

/